

ABSTRACT

The present invention provides a filter with which organic matter, bacteria, viruses, and other harmful substances can be trapped, and the trapped material can be sterilized and decomposed, at low cost and extremely high efficiency.

A porous ceramic or metal is used as a substrate, and a porous semiconductor composed of a semiconductor material having a light emitting function is formed in the interior or on the surface of this substrate. An electrode is provided to this product to serve as a filter, voltage is applied so that ultraviolet light is emitted while a fluid is being filtered, and any harmful substances are filtered and simultaneously sterilized and decomposed.

The porous semiconductor layer is preferably composed of columns grown perpendicular to the substrate plane, and has the function of emitting ultraviolet light with a wavelength of 400 nm or less. The pores in the porous substrate column are through-holes perpendicular to the substrate plane, and the average size of these pores is preferably from 0.1 to 100 μm . The distal ends of the columns preferably have a pointed shape.

To manufacture, a suspension of semiconductor particles having a light emitting function is filtered through the porous substrate serving as a filter medium so as to form a deposited layer of semiconductor particles on the porous substrate surface. A deposited layer of p-type semiconductor particles and a deposited layer of n-type semiconductor particles may also be formed so that these form a pn junction.

Further, the present invention is characterized in that an insulating layer is formed on the top and bottom surfaces of the porous semiconductor layer, and

semiconductor particles are dispersed in the insulating layer, with the bandgap of the semiconductor particles in the porous light emitting layer or the porous semiconductor layer being at least 3.2 eV, and being doped with gadolinium, which is the light emitting center.

In addition, the porous semiconductor layer may be made of porous silicon nitride composed of columnar Si_3N_4 particles with an average aspect ratio of at least 3 and an oxide-based binder phase containing at least one of rare earth element, and emit visible light or ultraviolet light.